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Notes on Malayan Dipterocarpaceae—I.

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For some months during 1932, by the courtesy of the Director of the Royal Botanic Gardens, Kew, I had the opportunity of studying the *Dipterocarpaceae* in the herbarium there. Examination of the type material reveals the necessity for re-adjustment of our conception of the botanical status of some of our trees and considerable reduction to synonymy with the consequent alteration of some of the accepted names.

I am dealing in this number mainly with some of our species of *Shorea* but include also *Balanocarpus multiflorus*, which is more closely related to a group of *Shorea* including *S. Faguetiana* and *S. hopeifolia* than to some of the other species of its genus, and has therefore been studied here.

With the synonymy I have given any references to literature or iconography affecting the argument or which may help to a clearer understanding of the species through description or figure. In many cases I have added short descriptive notes which seem to me desirable for a more complete understanding of the botanical characters of the species. The concluding paragraph of the notes under each species is for the benefit of Malayan Forest Officers who are concerned less with the details of synonymy than a botanical name for the trees they meet in the jungle.

The majority of the drawings of leaves and inflorescence are by Mr. Wong Sze Moy of the Forest Research Institute, Kepong. The drawings of the flower parts I have done myself.

I am particularly grateful to Mr. Henderson of the Herbarium, Singapore, for assistance in the publication of these notes and to Dr. van Slooten of Buitenzorg for most generously lending me valuable type sheets.

✓ *Shorea Hemsleyana*, King, MSS. in herb. Calcutta; Foxworthy, Mal. For. Rec. 10 (1932) 167, in part: *Balanocarpus Hemsleyanus*, King, Journ. Asiat. Soc. Bengal, lxii, 2 (1893) 134, & Ann. Bot. Gdns. Calcutta, V, 2 (1896) 160, pl. 193; Brandis, Journ. Linn. Soc. xxxi (1895) 109: *Shorea grandiflora*, Brandis, l.c. 93; *Pachychlamys Hemsleyanus*, Ridley, Flora Mal. Penin. I (1922) 234.—Plate XXXIII.

This species was first described by King in 1893 from several collections made in Penang and Perak (Curtis 2512;

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King's Coll. 5431, 6670 & 7562; Scort. 1653). He described the plant as *Balanocarpus Hemsleyanus* but added a note upon the anomalous nature of the species which had flowers more like those of a *Shorea*. In 1922 Ridley placed the species in the genus *Pachychlamys*, a genus named in manuscript by Dyer. Foxworthy in 1932 removed it to the section *Brachyptera* of the genus *Shorea* where it is most happily placed. I am reducing to synonymy with this, *Shorea grandiflora* described in 1895 by Brandis from a Bornean collection of Haviland No. 2121. There is no doubt whatever of the identity of these species although Hav. 2121 has flowers above the average size of those in our collections and has a more hairy ovary. In King's original description of *B. Hemsleyanus* he says, "Ovary elongate-conic, tomentose, tapering into a sparsely puberulous style" but Brandis and Foxworthy describe the ovary and style as glabrous and Ridley omits to mention it. Actually the ovary and style are quite glabrous in young buds but as the flower develops a fine silky pubescence appears as a ring around the upper portion of the ovary and may extend to the style.

Foxworthy's conception of the species (Mal. For. Rec. 10, 167) is not clear as he has included under *S. Hemsleyana* all our collections of *Shorea macrantha*, Brandis, a closely allied but quite distinct species. His description however is evidently based upon authentic material of *Shorea Hemsleyana* but the following addition might be made—The flowers may be as much as 1.8 cm. long. The three rows of stamens are not always evident, the two shorter rows sometimes being almost equal. The filaments are many times longer than the anthers and the connectival appendages, erect in youth and curved or deflexed in age, are about twice as long as the anthers. The ovary is glabrous in youth but becomes silky pubescent as it matures.

Collections examined—

PENANG: Curtis, 2512.

PERAK: King's Collector, 5431, 6670 & 7562;
Scortechini 1653; C.F. 12001, 12002,
12018 and 12019.

BORNEO: Haviland 2121 (Type of *S. grandiflora*,
Brandis).

This tree is probably not well-known to Malayan Forest Officers as all the collections in the F.R.I. Kepong are exclusively from Parit reserve in Kinta district where it is known as *chengal pasir*. With the reduction of *S. grandiflora*, Brandis to synonymy we have now to record this species also from Borneo.

✓ *Shorea macrantha*, Brandis, Journ. Linn. Soc. xxxi (1895) 97; *Shorea Hemsleyana*, Foxworthy, Mal. For. Rec. 10 (1932) 167, in part, not of King.—Plate XXXIV.

This species was described by Brandis from a flowering collection No. 2119 of Haviland from Borneo. There is a close similarity between this species and *Shorea Hemsleyana*, King both in flower and fruit and Foxworthy has included our collections along with authentic material of the latter species. Brandis placed the species in the Section *Pinanga* but his judgment was based on the evidence of flowering material only. Fruiting collections show clearly that the species belongs to the Section *Brachyptera* as conceived by Heim.

It is possible to amplify considerably Brandis' description with the material now available.

Medium sized trees; young branches stout, covered with a dense tawny stellate tomentum. *Leaves* coriaceous, elliptic oblong, shortly abruptly acuminate, slightly inequilateral, base cordate or truncate; upper surface brown glabrous shining except along the densely tomentose midrib; lower densely ferruginous or tawny stellate tomentose or scabrid; margins slightly revolute; secondary nerves 12–17 pairs, anastomosing at the margins, inconspicuous above, prominent beneath; tertiary nerves parallel, prominent beneath; size of mature leaves very variable, 6–18 cm. long by 3–7 cm. broad; petiole up to 7 mm. densely tawny tomentose; stipules sub-falcate, persistent, tawny tomentose, broad at base, acute at apex, 5-nerved. *Panicles* axillary and terminal, racemose, up to 12 cm. long, branches short distichous each subtended by two persistent stipular bracts, all tawny tomentose; flowers 2–5, fascicled on the short branchlets, each subtended by two small more or less persistent bracts, sessile. *Sepals* 5 mm. long ovate acute stellate tomentose without, glabrous within, three rather larger than the other 2. *Petals* linear up to 2.9 cm. in mature flowers, glabrous inside, tomentose along one half outside (said to be “red and white”). *Stamens* 15 in 3 rows; filaments broad and flattened at base, those of the smallest row about 4 times as long as the anthers; appendage to connective 1–2 times as long as the anther, filiform, erect in bud becoming curved or deflexed in age. (The appendages of the largest row of stamens are usually relatively smaller than those of the other rows and are often obscured beneath the anthers in mature flowers). *Ovary* glabrous or minutely sericeous puberulous in mature flowers, narrowing into a glabrous filiform style 2–3 times as long as the ovary. *Stigma* deltoid. *Ripe fruit*, oblong apiculate, tawny tomentose, up to 5 cm. long by 2 cm. broad. Persistent sepals nearly equal, bases thickened woody,

slightly rugose and tawny puberulous, 2 cm. long by 1.5 cm. wide, forming a cup which embraces the lower portion of the fruit.

We have several collections of this tree from Pahang which are distinct from other collections in having leaf nerves depressed on the upper surface to give a quilt-like appearance and in that the lower surfaces of the leaves are scabrid rather than tomentose, but I can detect no essential differences in this form.

Comparison of S. macrantha, Brandis and S. Hemslleyana, King. There is a very close similarity between these species but *S. macrantha* may easily be distinguished by the smaller, more oblong, inequilateral leaf and shorter petiole and, in flower, by the long linear corolla lobes.

Collections examined—

PERAK: Singapore 13247; C. F. 0314, 1241, 8050, 8808, 9722, 9751, 10260, 10290, 10460, 10493, 10810 and 27805.

PAHANG: C. F. 3553, 15039, 15684 and 15751.

BORNEO: Haviland 2119 (Type of *S. macrantha*, Brandis).

This also appears to be a tree of comparatively restricted distribution and therefore probably not well-known to many Malayan Forest Officers. Our collections are all from flat land either in Perak where the tree is known as *chengal pasir* or from Pahang where it is known as *kepong hantu*. The occurrence of this tree in the same locality and under the same vernacular name in Perak as *Shorea Hemslleyana* is probably responsible for its confusion with that species.

✓ *Shorea rugosa*, Heim, Bull. Soc. Linn. Paris (1889) 973; Brandis, Journ. Linn. Soc. xxxi (1895) 96: *Shorea verrucosa*, Dyer, MSS. in herb. Kew: *Shorea* sp., Foxworthy, Mal. For. Rec. 3 (1927) 37, with two plates: *Shorea uliginosa*, Foxworthy, Mal. For. Rec. 10 (1932) 210 and 277.—Plate XXXV.

The type material of *S. rugosa*, Heim was collected in Borneo by Beccari between 1865 and 1868. These collections (Becc. 2638 and 2890) do not show the cupping of the leaves seen in the type of *S. uliginosa*, Foxw. but the flower structure and texture of parts is absolutely identical.

In briefly describing this material Brandis says that the stigma is tri-partite but in all flowers I have examined the stigma has been small and either simple or minutely papillose. Otherwise Brandis' description agrees with that of Foxworthy for *S. uliginosa* to which I have little to add except that the cupping of the leaves is by no means always

evident in herbarium material; the sepals are unequal, the two inner being half the size of the three outer; the stamens are of three sizes, two relatively short rows and one long, and the connectival appendage of the smaller stamens becomes deflexed only as the flower matures.

Collections examined—

PERAK: C. F. 17065, 27803, 27819 and 27831.

SELANGOR: C. F. 0432, 3263, 7938 (Type of *S. uliginosa* Foxw.), 11001, 21968, 23228, 24865, 27065, 27696, 27872, 28381, 29051, 29052, 29053, 29059, 29060, 29101, 29102 and 29103.

BORNEO: Beccari 2638 and 2890 (Types of *S. rugosa*, Heim), Haviland 2252.

This tree is our common cup-leaved form of *meranti bakau* found in freshwater swamp. Dr. Foxworthy's name of *Shorea uliginosa* is here reduced to synonymy with *S. rugosa*, Heim from Borneo.

✓ **Shorea platycarpa**, Heim, Bull. Soc. Linn. Paris, ii (1891) 956: *Shorea nigrescens*, Dyer, MSS. in Herb. Kew: *Shorea leprosula*, Boerl., Cat. Hort. Bog. (1899) 110, not of Miquel: *Shorea palustris*, Ridl., Fl. Mal. Penin. I (1922) 224; Foxworthy, Mal. For. Rec. 10 (1932) 212.—Plate XXXVI.

Heim's original description was drawn from a Bornean collection of Beccari (3302) bearing very young fruit. Ridley's type of *S. palustris* (C. F. 2073) has vegetative parts which are absolutely identical and fruits which are nearly mature. I have felt more confident in identifying Ridley's species with that of Heim after examining a Bornean collection of Haviland (2252) which was included under the *Shorea leprosula* cover at Kew. This bears flowers which are identical in every way with those from our collections from the peninsula.

The flower of this species has been described by Foxworthy from C. F. 0310. On his description I should like to comment that in none of the flowers examined have I found any trace of scabrities on the awns which, as in *S. rugosa*, Heim, *S. lepidota*, Bl. etc. are at first erect but later become deflexed. Also the stigma is distinctly deltoid. This is an important point as it seems to be one of the few essential differences between the flowers of this species and those of the two just mentioned.

Collections examined—

DINDINGS: C. F. 2329 and 27842.

PERAK: C. F. 14373, 24601, 24615, 27801, 27808, 27823 and 29064.

- SELANGOR: C. F. 0310, 2073 (Type of *S. palustris*, Ridl.), 2920, 15310, 15337, 17043, 17044, 17045, 27063, 29058 and 29705.
- PAHANG: C. F. 6657, 15677 and 20131.
- JOHORE: C. F. 2372.
- SINGAPORE: S'pore 406 (Cult. in Econ. Gdns.).
- JAVA: Herb. Bog. 233 (Cult. in Hort. Bog. VII-B-40).
- BORNEO: Beccari 3302 (Type of *S. platycarpa*, Heim); Haviland 2253; C. F. 28695 (Brunei).

This is the tree frequently known to Malays as *meranti kait-kait*, *meranti paya* etc. or has been referred to as "the round-leaved form of *meranti bakau*" (vide Foxworthy).

- ✓ *Shorea Teysmanniana*, Dyer, ex Brandis, Journ. Linn. Soc. xxxi (1895) 100: *Shorea cochinchinensis*, var *oligoneura*, Boerl., Cat. Hort. Bog. (1901) 107: *Shorea paludosa*, Foxw., Mal. For. Rec. 10 (1932) 277.—Plate XXXVII.

The species was originally described in 1895 by Brandis from a sterile collection of Teysmann from Bangka. The unsatisfactory type specimen consists of a twig with six rather immature leaves and two buds, and it is not surprising to find that it has been overlooked by subsequent authors. The species next appeared as a fruiting collection from a tree in the Buitenzorg Gardens which was catalogued by Boerlage as *S. cochinchinensis*, var *oligoneura*. In 1932 Foxworthy described his *S. paludosa* from a fruiting collection identical with Boerlage's specimen. Haviland's collections Nos. 2255 (flower and fruit) and 2330 (flower) are the only flowering specimens I have seen.

That the above are all identical there can be no doubt. A very distinctive vegetative feature which is evident in Brandis' original type and in every other collection I have examined, is the presence of long-stalked vegetative buds.

The fruit of this species has been described by Foxworthy. The following flower description is drawn from Haviland 2255. Unfortunately when examining the specimen I omitted to make complete notes on the nature of the inflorescence.

Flowers sessile, 7 mm. across when expanded. *Sepals* ovate, acute, tomentose outside and glabrous within, three large and two smaller, the largest about 2 mm. high. *Petals* oblique oblong 6 mm. long by 1.5 mm. broad when expanded, tomentose along one side without, glabrous within.

Stamens 15 in 2 rows, the larger, of five stamens, twice as long as the smaller; filaments several times longer than the anthers, flattened, and much expanded at the base; appendage to connective of large stamens a minute awn which becomes curved and deflexed in age; appendage of smaller stamens 2-3 times as long as the anthers, at first erect, later curved. *Ovary* about 1 mm. long consisting of a lower glabrous portion and an upper finely tomentose, ridged, conical portion tapering into a style as long as the ovary and glabrous above; stigma enlarged and disc-like.

Collections examined—

- SELANGOR: C.F. 3264, 23229, 23939 (Type of *S. paludosa* Foxw.), 24566, 24567, 27064, 27069 and 29054.
- BANGKA: Teysmann (Type of *S. Teysmanniana*, Dyer) and Herb. Bog. 6591.
- JAVA: Herb. Bog. 229 (VII-C-25 in Cat. Boerl.-authentic specimen of *S. cochinchinensis* var *oligoneura*, Boerl.).
- BORNEO: Haviland 2255 and 2330.

This is the swamp tree which has been collected in the Peninsula only from Kuala Langat and Telok Reserves in Selangor where it is known as *meranti bunga*. It is here shown to be not a "new species" but one described by Dyer in 1895 as *Shorea Teysmanniana*.

✓ ***Shorea lepidota*** (Korth.) Blume, Mus. Bot. ii (1852) 32; Brandis, Journ. Linn. Soc. xxxi (1895) 96; not of Foxworthy, Mal. For. Rec. 10 (1932) 166: *Vatica lepidota*, Korth., Verh. Nat. Gesch. Bot. (1839) 73: *Vatica* ? *stipulosa*, Miq. Fl. Ind. Bat. Suppl. (1860) 486: *Shorea* ? *nitens*, Miq. l.c. 488: *Shorea stipulosa*, Burck, Ann. Jard. Buit. VI (1887) 220: *Shorea megistocarpa*, Foxw., l.c. 216, Pl. xvii.—Plate XXXVIII.

This species was first described from fragmentary flowering material from Sumatra by Korthals in 1839 as *Vatica lepidota*. In 1852 Blume referred the plant to *Shorea*. In 1860 Miquel, with a sterile Sumatran collection of Teysmann's described his *Vatica* ? *stipulosa* which in 1887 was referred to the genus *Shorea* by Burck. Contemporaneously with his description of *V. stipulosa*, Miquel published his *Shorea* ? *nitens*. He evidently failed to identify these as one species because the type of *V. stipulosa*

represents the immature stage with long leaf and woolly stem rather different from the more mature stage represented by *S. nitens*.

Brandis made the reduction of *S. nitens* Miq. to *S. lepidota*, Bl. in 1895. He also states that "*S. stipulosa* Burck (= *V. stipulosa*, Miq.) may possibly belong to this species." With the material of this species now at our disposal it is possible with confidence to remove the doubt from his statement.

Van Slooten ex Heyne in Nutt. Plant. Ned. Ind. 2nd edit. (1927) 1121 gives *S. aptera*, Burck, *S. palembanica*, Miq., *S. nitens*, Miq., *S. stipulosa*, Burck, *V. lepidota*, Korth. and *V. stipulosa*, Miq. as synonyms of *S. lepidota*, Bl., but is mistaken in uniting the first two with the others. *S. palembanica* Miq., to which is reduced *S. aptera*, Burck, (see notes on *S. palembanica*, Miq.), is the tree described by Foxworthy under *S. lepidota*. It grows along stream banks and has large, short-winged fruits which are valued for their fat. *S. lepidota* (Korth.) Bl., to which the others are reduced is the quite distinct tree described by Foxworthy as *S. megistocarpa*. It has a fruit of the usual long-winged type of *Shorea*. The types of *V. lepidota* Korth., *V. stipulosa* Miq. and *S. nitens*, Miq. are superficially not unlike collections of *S. palembanica* but may be distinguished by the narrower and more oblong leaves, the somewhat shorter and more delicate petioles, the slightly flattened branchlets and the large, long-persisting, sub-falcate papyraceous stipules. The type of *V. lepidota*, Korth. consists of an immature twig and a twig with peduncles which bore very young fruit all of which have fallen except on the Buitenzorg sheet. This sheet which retains three young fruit and exactly matches C.F. 636 provides the key to the identity of *S. megistocarpa*, Foxw. with *S. lepidota*, (Korth.) Bl. The type of *V. stipulosa*, Miq. consists of sterile twigs from a seedling or sapling with long, short-petioled leaves, a woolly stem and large persistent stipules. Once recognised seedlings of this species are easily distinguished. The type of *S. nitens*, Miq. is a sterile mature twig and finds an almost exact match in C.F. 26050 and others.

This tree (*S. lepidota* (Korth.) Bl.), then, is that which Foxworthy has described as *S. megistocarpa*. He has fully described the species but I should like to add the following notes—

Sepals unequal, the two inner only half the length of the three outer: *Petals* linear-oblong when fully expanded, up to 8 mm. long: *Stamens* of two heights, the five inner twice the height of the ten outer; filaments tend to be

hollowed out from the posterior as in *S. gibbosa*, appendage to connective of large stamens about as long as the anther, that of small stamens about twice as long as the anther. In young buds all appendages are erect but as anthesis approaches first those of the posterior row of stamens become deflexed and later the remainder also. *Ovary* is finely pubescent. (This is one of the few floral distinctions between *S. lepidota* and *S. rugosa*. In the latter the ovary is densely tomentose).

Collections examined—

KEDAH:	C.F. 11465 and 12219.
PERAK:	C.F. 8339, 12981, 24647, 25551 and 27225.
NEGRI SEMBILAN:	C.F. 636 and 23349.
TRENGGANU:	C.F. 26701, 26892 and 26936.
PAHANG:	C.F. 1292, 2395, 5435, 6661, 6827, 8110, 10611, 13773, 23877, 24373, 26042, 26050, 26504, 26518 and 31507.
JOHORE:	C.F. 5893 (Type of <i>S. megistocarpa</i> , Foxw.) and 6012.
SUMATRA:	Herb. Utrecht 35913 (= Herb. Bog. 797 Teysmann (Type of <i>S. nitens</i> , Miq.), 35916 (= Herb. Bog. 2076) Diepenhorst (Type of <i>V. stipulosa</i> , Miq.), 3917 sine nota, 35918 Korthals (Type of <i>V. lepidota</i> , Korth) and 72529 (= Herb. Bog. 591) Teysmann; Herb. Bog. 589 Teysmann.

This is the large *meranti* found usually on low-lying land and known sometimes as *meranti pala*. It has been described as *Shorea megistocarpa* (vide Foxworthy l.c. 217) which is here shown to be identical with the older species *S. lepidota* (Korth.) Bl. by which name it must in future be known. The name *S. lepidota* is shown to have been misapplied to what is actually *S. palembanica*, Miq.

- ✓ *Shorea parvifolia*, Dyer, in Hook. f. Fl. Brit. Ind. i (1872) 305; King, Journ. Asiat. Soc. Beng. lxii, 2 (1893) 112 in part; Brandis, Journ. Linn. Soc. xxxi (1895) 92; Foxworthy, Mal. For. Rec. 3 (1927) 31 with 2 plates; not of Foxworthy, Mal. For. Rec. 10 (1932) 199; *Shorea scutulata*, King, l.c. 110; Brandis, l.c. 102; Foxworthy, l.c. 201.—Plate XXXIX.

This species was first briefly described by Dyer from three flowering collections (2549, 1577 and 1197) made

by Maingay in Malacca. These were all given the Kew distribution number 206. In 1893 King amplified Dyer's description but from the fact that he says, "apiculus of connective very slender, about as long as the anther," I am inclined to think that he did not examine authentic flowering material of *S. parvifolia*, Dyer. Actually King cites Curtis 201 under *S. parvifolia*. It is a good flowering collection and was very probably examined by him but it is not *S. parvifolia*, Dyer but the closely related *S. ovata*, Dyer (See *S. ovata*). Had King examined authentic flowers of *S. parvifolia*, Dyer it is improbable that he would have redescribed the species as *Shorea scutulata*, King. I have examined flowers of Curtis 1396 from Penang, the type of *S. scutulata*, and also flowers from the types of *S. parvifolia*, Dyer and have no hesitation in uniting these species. King in his description of *S. scutulata* makes the statement that the anthers are inappendiculate and Brandis says of that species—"in bud I have invariably found a short pointed apical appendage." In my experience the appendage is invariably present although it becomes deflexed as the flower matures and is at least twice as long as the anther.

The plant referred by Foxworthy to *S. parvifolia* is actually *S. ovata*, Dyer. Foxworthy has given a full botanical description of this species under *S. scutulata* but I should like to make the following remarks—On each branchlet of the panicle there are usually 3–5 flowers, each about 7 mm. long. *Sepals* of two sizes, the three outer, broadly lanceolate ovate obtuse, are 2–3 times as long as the two inner which are ovate acute. *Petals* when mature, 3 times as long as the largest sepals. *Antherine appendage* at first erect, becomes deflexed in age. *Ovary* consists of a glabrous basal portion and a slightly ridged sericeous upper portion considered by Brandis to be a stylopodium. The style is about the same length as this stylopodium.

Among our numerous collections of this species there is a certain amount of variation. Collections from Kedah and Perak frequently have more elongate stipules than those from Selangor, and other collections, mainly from Pahang, have more oblong leaves which are more uniformly puberulous on the under surface. In the field also I have noted that the tree in Perak appears somewhat different from what I consider to be the same species in Selangor. However after careful examination of our herbarium material I must conclude that these variations do not constitute specific distinction. Moreover Dyer's type collections are not all identical. 2549 is typical of the form found in Selangor while 1577 and 1197 represent the Pahang form.

These minor differences may therefore reasonably be considered within the range of variation of the species.

Comparison of S. parvifolia, Dyer with S. ovata, Dyer. These two species are so very much alike that an enumeration of the essential differences may be useful. The trees are less likely to be confused in the field than in the herbarium because *Shorea parvifolia* is typically a tree of the plains while *S. ovata* is exclusively a hill form rarely seen below 1,000 ft. In the herbarium sterile specimens of *S. ovata* may be recognised by the typical ovate leaf of thicker texture and with a slightly longer petiole than *S. parvifolia*. Flowering specimens of *S. ovata* usually have more flowers on each branchlet of the raceme which are usually distichous as opposed to secund, but the only really reliable floral distinction is in the length of the antherine appendage. This in *S. ovata* is not more than the length of the anther while in *S. parvifolia* it is from 2-3 times as long as the anther.

Collections examined—

SIAM:	S'pore 24220, 24223 and 24335.
PENANG:	Curtis 1396 (type of <i>S. scutulata</i> , Dyer); S'pore 3465 and 3750; C.F. 25638 and 28044.
KEDAH:	C.F. 7597, 7608, 8901, 8911, 8979, 10054, 11466, 11469, 12226, 12597, 17753 and 17865.
PERAK:	C.F. 037, 038, 0131, 0133, 0117, 4554, 8305, 10370, 10395, 11025, 16340, 11026, 13223, 16635, 24493, 24603, 25438, 25585, 27802, 27818 and 28972.
SELANGOR:	C.F. 725, 739, 3337, 4658, 5712, 5791, 7064, 7911, 9543, 9544, 9550, 10897, 13261, 13954, 14907, 15263, 15358, 16475, 16489, 16906, 21374, 21961, 22070, 23098, 23124, 23125, 23126, 23127, 23128, 23852, 24886, 26351, 26385, 27895 and 28368.
NEGRI SEMBILAN:	C.F. 0610, 0611, 0621, 0630, 2007 and 23701.
MALACCA:	Maingay 1577, 1197 and 2549 (K.D. 206, Types of <i>S. parvifolia</i> , Dyer); C.F. 2015 and 2052.

TRENGGANU: C.F. 26711.

PAHANG: S'pore 24052; C.F. 1018, 1019,
1274, 1276, 1278, 4628, 4795,
4999, 5065, 5090, 5437, 5503,
5508, 5509, 6612, 8136, 8146,
10610, 10614, 14002, 15145,
17128, 23375, 23386, 23419,
26176, 28221 and 28313.

JOHORE: C.F. 5856, 5862, 5966, 6014 and
6151.

SINGAPORE: S'pore 634.

This is the tree usually known as *meranti sarang punai*, one of our most common softwooded Shoreas.

Shorea ovata, Dyer, ex Brandis, Journ. Linn. Soc. xxxi (1895) 91: *Shorea parvifolia*, King, Journ. Asiat. Soc. Bengal. lxii, 2 (1893) 112 in part; Foxworthy, Mal. For. Rec. 10 (1932) 199, not of Dyer in Hook. f. Fl. Br. Ind. i (1872) 305 and Brandis l.c. 92.—Plate XL.

The earliest cited collection of this species appears to be Curtis 201, Penang. This was included by King under *Shorea parvifolia* in 1893. In endeavouring to amplify Dyer's brief description of *S. parvifolia*, King apparently examined the best available flowering collection of what he considered to be that species i.e. Curtis 201 and described not the flowers of *S. parvifolia* but *S. ovata*. In 1895 Brandis published the first description of *S. ovata* using an MSS. name given by Dyer to a collection of Beccari (3092) from Borneo. Brandis cited also Haviland 2042 from which he gave an unsatisfactory description of the flowers of his species. He failed however to identify Curtis 201 with this species, presuming he saw the collection. Thus it is that King's error in including Curtis 201 under *S. parvifolia* has been responsible for the fact that *S. ovata* has never been recorded from the Peninsula, because subsequent authors have included our *S. ovata* material along with authentic collections of *S. parvifolia* under the last name. Foxworthy, however, has endeavoured to separate these species by confining the name *S. parvifolia* to what is actually *S. ovata* and considering the remainder as *S. scutulata*.

This species has been botanically described under *S. parvifolia* by Foxworthy but to his description I should like to add the following remarks—The flowers are more often distichously arranged than secund and there are usually 5–10 on each branchlet of the panicle. *Sepals* of two sizes, the three outer considerably longer than the two inner. *Petals* when mature at least three times as long as

the sepals. *Stamens* of three sizes, the smallest row of 5 has filaments about 4 times as long as the anthers, those of the largest row are more than twice as long while the filaments of the middle row are intermediate in height. *Ovary* consists of a glabrous basal portion and a sericeous upper portion considered by Brandis to be a stylopodium. Style is not quite as long as the hairy portion. *Ripe fruit* is usually, although not invariably, markedly beaked.

Collections examined—

PENANG: Curtis 201, 437 and four unnumbered specimens. S'pore 3301, 3341, 3463, 3691, 4330, 4569, 4578, 4902 and 9139; C. F. 11654, 11659, 11660 and 27776.

PERAK: C. F. 25430, 25523, 25569, 25750 and 25818.

DINDINGS: C. F. 27760.

PAHANG: C. F. 20353, 20447 and 23388.

BORNEO: Becc. 3092 (Type of *S. ovata*, Dyer); Haviland 2042.

This tree is typically a high hill form. Because of its habitat it is not well-known to Malays who, when they come across it, usually call it *meranti sarang punai* because of its resemblance to the common *meranti sarang punai* of the plains (*S. parvifolia*).

Shorea palembanica, Miq., Fl. Ind. Bat. Suppl. (1860) 487: *Shorea aptera*, Burck, Ann. Jard. Buit. vi (1887) 210, pl. 22: *Shorea brachyptera*, Heim, Bull. Soc. Linn. Paris, ii (1891) 957: *Pachychlamys Beccarianus*, Dyer, MSS. in herb. Kew: *Shorea lepidota*, Foxworthy, Mal. For. Rec. 10 (1932) 166; not of Blume, Mus. Bot. ii (1852) 32.—Plate XLI.

This species was first described as *S. palembanica* by Miquel from a sterile collection made by Teysmann in Palembang. In 1887 Burck examined Bornean collections in flower and fruit describing and figuring them as *S. aptera*, and four years later Heim re-described the tree as *S. brachyptera* from Beccari's collections from Sarawak.

I have not seen the specimens upon which Burck founded his *S. aptera*, but I have seen other collections verified by him, which, together with his published figure, leave no doubt as to his conception of the species. It is somewhat misleading however, that the leafy twig of his figure is from a sapling or, at any rate, is hardly characteristic of the mature form.

Foxworthy's *S. lepidota* is undoubtedly identical with the above. Presumably he has followed Van Slooten (ex

Heyne, Nutt. Plant. Ned. Ind. 2nd. edit. (1927) 1121) in reducing *S. aptera*, Burck to *S. lepidota* (Korth.) Bl. There has been great confusion of these species which I have endeavoured to straighten out in my notes under *S. lepidota*.

Under *Shorea Thiseltoni* (Syn. *S. singkawang* (Miq.) Burck) King has cited No. 8162 which clearly ought to be referred to *S. palembanica*, Miq.

Foxworthy, under *S. lepidota* gives an adequate description of this species but the following remarks are appropriate—The tertiary nerves of the leaf are parallel. The flowers are not reddish but yellow and are borne on a pedicel only 1 mm. long. The stamens are of three sets; the large inner row of five has filaments broadly dilated in the lower half, suddenly narrowing to the filamentous upper half; the two other rows are subequal, one row of five being borne on the backs of the inner large stamens with which the third five alternate; the filaments of these smaller stamens have a very short filamentous portion. The ovary is usually distinctly 5-ridged. All the immature fruits examined have three wings exceeding the nutlet by 1–2 cm. and two much shorter wings. The only perfectly mature specimens I have seen have had the wings broken. The nutlet is acuminate and velvety.

Collections examined—

PERAK:	King 8162 and C.F. 5696.
TRENGGANU:	C.F. 26800 and 26939.
PAHANG:	C.F. 2736 and 2741.
JOHORE:	S'pore 21184; C.F. 5905.
SUMATRA:	Herb. Utrecht 35907 (= Herb. Bog. 3681) Teysmann (Type of <i>S. palembanica</i> , Miq.); Herb. Bog. 3P/876, Irwaan.
JAVA:	Herb. Bog. 227 and sine no. "teste Burck"; Herb. Bog. sub VIII. D. 56 ^a cult. in Hort. Bog.
BORNEO:	Herb. Bog. sine no., Teysmann "det. Burck," 2077 (bb. 1087) Labohm and sine no. Kuching, Hewitt; Beccari 2681, 3075 and 3507 (Types of <i>S. brachyptera</i> , Heim. [= <i>P. Beccarianus</i> , Dyer MSS.]); C.F. 390, Sarawak.

This tree is not well-known to Malayan Forest Officers. It is invariably found along stream banks and is rarely well shaped. It has been collected in Perak and Johore under the name of *sengkawang*, in Trengganu as *tengkawang ayer*, and in Pahang as *merpak*.

Shorea gibbosa, Brandis, Journ. Linn. Soc. xxxi (1895) 99: Ridley, Journ. Str. Br. R. As. Soc. 54 (1909) 23 and Flora. Mal. Penin. 1 (1922) 229; Foxworthy, Mal. For. Rec. 10 (1932) 208: *Hopea grisea*, Brandis, l.c. 63.—Plate XLII.

The descriptions of *S. gibbosa* and *H. grisea* were published contemporaneously by Brandis in 1895. Both were described from flowering collections, the former from Singapore by Ridley and the latter from Borneo by Beccari. It is difficult to understand how Brandis failed to identify the type collection of *S. gibbosa* with those of *H. grisea* as they are strikingly alike although the flowers of the latter are in the stage of young bud only whereas those of the former are almost fully developed. In examining the flowers of *H. grisea*, Brandis evidently noticed no gibbositities on the inner row of stamens. I have examined numerous flowers of *S. gibbosa* in various stages and find that the gibbositities are not evident in young buds.

Ridley amplified Brandis' original description in the works cited above and Foxworthy has reproduced Ridley's description. This description is adequate but Ridley has, I think, misinterpreted Brandis' statement with regard to the number of stamens. Brandis says "The filaments of the 5 inner stamens gibbous on the outside. Below this protuberance are inserted the 5 episepalous stamens of the outer circle." He does not state that the stamens are 10 only as Ridley and Foxworthy have inferred, and, as he has placed the species in the Section *Pinanga* presumably he recognised it to have 15 stamens. This actually is the case, the inner gibbous stamen being supported on the outside by two slightly smaller ones with overlapping filament bases. The gibbosity is not a solid structure but is in the nature of a hollow protuberance. There is also some discrepancy over the colour of the flowers. These I have never seen in fresh condition. Ridley originally stated that they were "pink" but later in his flora, pronounced them to be "creamy white."

Collections examined—

SINGAPORE:	Ridley 6079 (Type of <i>S. gibbosa</i> , Brandis) S'pore 3407 and 5963.
BORNEO:	Beccari 2232 and 2267 (Types of <i>H. grisea</i> , Brandis).

With this reduction we now have to record from Borneo this apparently rare species hitherto known only from a single tree which stood near the Botanic Gardens, Singapore.

✓ *Shorea eximia* (Miq.) Scheff., Nat. Tijdschr. Ned. Ind. xxxi (1870) 349; Burck, Ann. Jard. Bot. Buitenzorg 6 (1887) 218; King, Journ. Asiat. Soc. Beng. lxii, 2

(1893) 121: *Vatica* ? *eximia*, Miq., Fl. Ind. Bat. Suppl.
 (1860) 486: *Vatica* ? *sub-lacunosa*, Miq. l.c.: *Shorea*
sub-lacunosa, Scheff. l.c. 350: *Dilleniaceum* ? *nervosa*,
 Wall. Cat. 6635: *Shorea sericea*, Dyer, Hook. f. Fl.
 Brit. Ind. I (1872) 306; King, l.c. 111; Brandis, Journ.
 Linn. Soc. xxxi (1895) 101; Foxworthy, Mal. For. Rec.
 10 (1932) 230: *Shorea rigida*, Brandis, Hook. Ic. Pl.
 (1895) t. 2402 and Journ. Linn. Soc. xxxi (1895) 102.
 —Plate XLIII.

This species was first described in 1860 by Miquel under two different names *Vatica* ? *eximia* and *Vatica* ? *sub-lacunosa*. His types were sterile collections from Sumatra and Bangka respectively. In 1870 Scheffer transferred these both to *Shorea* and in 1887 Burck united them.

A flowering collection (Maingay 202, Malacca) was first described by Dyer in 1872 as *Shorea sericea*. In 1895 Brandis referred a Bornean collection of Beccari, No. 2603, to *S. sericea* and redescribed the species as *Shorea rigida* from a Singapore collection of Ridley, No. 6393. These last two species have recently been united by Foxworthy.

Brandis, (l.c. 98) has united *S. eximia*, Scheff. with *S. furfuracea*, Miq. (l.c. 488) and has been followed by Ridley in Fl. Mal. Penin. I (1922) 232 and Merrill in Enum. Phil. Fl. Pl. III (1923) 96. I cannot agree to this union. The type of *S. furfuracea*, Miq. is an unsatisfactory sterile collection of immature leaves but is clearly different from *S. eximia*, Scheff. as has been pointed out by Van Slooten (ex Merr. Univ. Calif. Publ. Bot. 15 (1929) 204).

King did not unite *S. sericea* with *S. eximia* but in amplifying Dyer's description of the former, he evidently noted the resemblance between the species because he states—"This resembles *S. lacunosa*, Scheff., but differs in not having persistent stipules." (Presumably he has written "*S. lacunosa*" in mistake for "*S. sub-lacunosa*").

The reduction of *S. sericea*, Dyer to *S. eximia*, Scheff. has already been indicated by Heyne (Nutt. Plant. Ned. Ind. 2nd edit. (1927) 1116) although in the 1917 edition of his work, p. 298, he gave *S. eximia*, Scheff. as a synonym of *S. furfuracea*, Miq. following Brandis.

The most complete description of this species is given by Foxworthy under *S. sericea* and Brandis' figure of *S. rigida* is very helpful. My experience in the examination of a number of flowers suggests the following alterations to Foxworthy's description—*Petals* elliptic oblong, retuse at apex, in mature flowers three times as long as sepals, glabrous within and along a narrow strip along one side without. *Stamens* from 55 to 67 (in flowers examined) on long filiform filaments, the longest almost as long as

the petals. Rudimentary appendage usually present although difficult to find. *Ovary* glabrous on lower portion but continued into an elongated conic sericeous stylopodium. Stigma broad and distinctly 3-partite.

Collections examined—

PENANG:	Curtis 431; S'pore 3471 & 3760; C. F. 2564 & 28019.
PERAK:	King 10998.
SELANGOR:	C. F. 733, 2445, 7052, 7909, 9623, 9642, 11200, 13925, 15289, 21373, 23853, 23867, 24005, 24014, 24708 & 26384.
NEGRI SEMBILAN:	C. F. 639, 646, 662, 665, 1930, 1931 & 23757.
MALACCA:	Maingay 202 (Type of <i>S. sericea</i> , Dyer).
TRENGGANU:	C. F. 26697, 26722, 26930, 26934 & 26938.
PAHANG:	C. F. 1022, 1794, 4068, 4529, 5456, 5475, 5732, 10859, 15015, 26511, 27954 & 28321.
SINGAPORE:	Wall. Cat. 6635 & Ridley 6393 (Type of <i>S. rigida</i> , Brandis).
SUMATRA:	"Pelembang, prope Muara-doea" Teysmann. (Type of <i>V. eximia</i> , Miq.).
BANGKA:	"Prope Plangas" Teysmann (Type of <i>V. sublacunosa</i> , Miq.).

The reduction made above recognises *Shorea eximia* as the correct botanical name for our common *meranti kepong*, the more commonly applied names of *S. sericea* and *S. rigida* lapsing into synonymy. There are many instances of species being described from immature sterile specimens and at another time from mature fertile collections under a different name. It is often not until more material representative of various stages of development is available that the names can be united. Just as a seedling form of *meranti tembaga* was described as *Shorea meranti* and later was united with *Shorea leprosula* which represented the mature form, so *S. eximia*, the immature form of *meranti kepong* is here united with *S. sericea* which represents the mature form. The older name which is retained, happens in this instance to have been applied to the immature form, whereas in the former instance it was applied to the mature form.

✓ *Shorea Maxwelliana*, King, Journ. Asiat. Soc. Beng. lxii, ii (1893) 114; Ridley. Fl. Mal. Penin. I (1922) 227; Foxworthy, Mal. For. Rec. 10 (1932) 194: *Shorea utilis*, King, l.c. 119; Foxworthy, l.c. 177: *Shorea barbata*, Brandis, Journ. Linn. Soc. xxxi (1895) 81; Foxworthy, Mal. For. Rec. 3 (1927) 68 with plate and Mal. For. Rec. 10 (1932) 178: ? *Shorea falcifera*, Dyer MSS. ex Brandis, l.c. 86: *Shorea ciliata*, Ridl., Agri. Bull. S.S. and F.M.S. 4 (1905) 63, not of King: *Shorea alba*, Ridl. Journ. Roy. As. Soc. S. Br. 82 (1920) 171.—Plate XLIV.

This species was first described by King in 1893 under two different names. The first was *S. Maxwelliana* which was based on two collections of fragmentary flowers and immature fruit made in Perak. The second was *S. utilis* described from a collection made in Penang. From his description it appears that he examined fairly good flowering material but now only fragmentary flowers remain on the sheet. There is no good reason why this should not have been identified with the material described as *S. Maxwelliana* but the latter have rather larger leaves and longer wings on the fruit.

The flowers of this species were first adequately described by Brandis in 1895 when he founded his *S. barbata* on a collection of Goodenough from Batang Malaka.

In examining the type material of *S. falcifera*, Dyer from Borneo I was struck by certain resemblances which it bears to *S. Maxwelliana*. When flowers of this Bornean form are available a more definite statement of the relationship of these species will be possible.

I have examined the collection of Moorhouse referred to by Ridley in op. cit. 1905, as *S. ciliata*. This undoubtedly is the species under discussion and not *S. laevis*, Ridl. to which Foxworthy refers it.

Ridley's *S. alba*, described in 1920, from a collection made in Penang is identical with *S. Maxwelliana*. The reduction of *S. alba*, Ridl. to *S. utilis*, King has already been made by Foxworthy in M.F.R. 10, 177. In the same year Ridley cited a sterile collection of *S. Maxwelliana* (Curtis 426) in describing his *Balanocarpus ovalifolius*. This same collection was wrongly identified by Brandis as *Balanocarpus latifolius* in l.c. 112 and also by Foxworthy in l.c. 143.

That Ridley had no clear conception of *S. Maxwelliana* is evident from the fact that in his flora he cites a specimen of Haniff from Penang (No. 3729) which is actually a *Hopea*.

With the aid of numerous sheets*of this species in our collections it seems desirable to amplify the rather unsatisfactory descriptions hitherto given.

Leaves coriaceous, sometimes slightly inequilateral or subfalcate, usually lanceolate or ovate-lanceolate but may be oblong lanceolate, acuminate or caudate-acuminate, the base cuneate or occasionally rounded; the upper surface glabrous shining, chocolate or yellowish brown when dry; the lower similar or distinctly lighter or covered by a minute close peltate fugaceous tomentum; main nerves 7–11 pairs, curved, spreading, depressed and inconspicuous above, slightly raised and more conspicuous beneath; tertiary nerves finely curved and inconspicuous; length usually about 7.5 cm. x 3 cm., but may be from 5–11 cm. long and 2–5.5 cm. broad. Petiole 1–1.5 cm. *Panicles* axillary and terminal, up to 10 cm. long, stellate puberulous or covered with a white mealy tomentum; lateral branches distant, less than 1 cm. long, minutely tomentose, 3–6 flowered. *Flowers* distichous, very shortly pedicelled, more or less globular in bud, 2 mm. long, when expanded 5 mm. across. *Sepals* ovate-orbicular, blunt, densely tomentose outside, glabrous inside. *Petals* white, broadly oblong, blunt, slightly contort, sericeous outside, sparsely so inside. *Stamens* (in flowers examined) 24–41; filaments slightly dilated at base up to twice as long as the oblong bi-fid anthers; anther cells densely bearded above, minutely bearded below; appendage to connective slightly dilated, densely ciliate, slightly longer than the anther. (In immature flowers the connective and appendage are relatively shorter and the hairs at the foot of the anther cells are sometimes inconspicuous). *Ovary* conical, sericeous tomentose; style glabrous, usually short; stigma minute. *Ripe fruit* globose or ovoid, beaked, pale adpressed-sericeous, 1 cm. long; beak .5 cm. long, accrescent sepal wings closely adpressed to but free from the fruit, membranous, reticulate, deciduously puberulous, variable in size; the three outer similar, 7-nerved, broadly spathulate, slightly constricted at base from 3 x 1 cm. to 6.5 x 1.5 cm.; the two inner, 3–4 nerved, less than half as long, more or less linear.

Collections examined—

PENANG:

Curtis 423 (Type of *S. utilis*, King) and 3651 (Type of *S. alba*, Ridl.); S'pore 3332, 3454, 3468, 3477, 3495, 3724 & 3733; C. F. 2568, 11671, 11677, 11680, 16637, 27774, 28030 & 28045.

PERAK :	King 3601 & 3744 (Types of <i>S. Maxwellliana</i> , King); C. F. 11736, 11966, 16054, 24480, 24503, 24640, 24645, 25413, 25423, 25429, 25487, 25821 & 25862.
DINDINGS :	C. F. 16560, 16577, 16597, 16651, 27764 & 27847.
SELANGOR :	C. F. 732, 24046, 24056 & 28053.
NEGRI SEMBILAN :	C. F. 5/1912, 401, 630, 653, 664, 721, 1901, 1934, 1982, 2145, 4314, 12821, 12822 & 23698.
MALACCA :	Ridley 1784 & 1789 (Types of <i>S. barbata</i> , Brandis); C. F. 2004, 4366 & 18272.
TRENGGANU :	C. F. 26903 & 26923.
PAHANG :	C. F. 4613, 4620, 4772, 4779, 5428, 5429, 5483, 5500, 5743, 6608, 6633, 10551, 10560, 10562, 10563, 15713, 15759, 15767, 26020 & 26036.
BORNEO :	? Beccari 2992 & 3046 (Types of <i>S. falcifera</i> , Dyer); ? Motley 37.

The failure to identify *S. Maxwellliana*, King with its synonyms given above has led to a regrettable vagueness in our conception of the botanical status of one of our most important hardwood trees. This tree is known usually as *damar laut daun kechil* in Penang, *damar laut kuning* in Kinta, *chengal batu* in the Dindings, *resak* in Selangor and Pahang, *kumus hitam* in Negri Sembilan and *tengkawang* in Trengganu but other names have also been applied (vide Foxworthy, Mal. For. Rec. 10 p. 177 and 179).

✓ *Shorea Faguetiana*, Heim, Bull. Soc. Linn. Paris, ii (1891) 975; Brandis, Journ. Linn. Soc. xxxi (1895) 95: *Shorea dryobalanoides*, Dyer, MSS. in Herb. Kew: *Shorea Ridleyana*, King, Journ. Asiat. Soc. Beng. lxii, 2 (1893) 115 and Ann. Bot. Gard. Calc. V ii (1896) pl. 185B, in part; Brandis, l.c. 99; Foxworthy, Mal. For. Rec. 10 (1932) 209 in part.—Plate XLV.

This species was first described from Bornean collections of Beccari in 1891. In 1893 King described his *S. Ridleyana* citing two collections from Perak belonging to different species. No. 3617 upon which his description appears mainly to be based is *S. Faguetiana*, while 3571 is *Shorea hopeifolia* (Heim) Symington. King's figure in

Ann. Bot. Gard. Calc. represents for the most part the former species but the detail of leaf venation is typical of the latter.

Brandis in l.c. says of the flowers of *S. Ridleyana*—"Appendage to connective denticulate towards the apex." I have failed to see any sign of denticulation in any of the flowers examined. Foxworthy has reproduced the descriptions of King and Brandis without amplification and has considered together our collections of this species and of *S. hopeifolia* under the name of *S. Ridleyana*.

King and Ridley have suggested a close relationship between *S. Ridleyana* and *S. Maxwelliana* but it appears to me that the relationship is very remote. The species most closely allied to *S. Faguetiana* are, in my opinion, *S. hopeifolia* (Heim) Symington and *Balanocarpus multiflorus* (Burck) Symington notwithstanding the fact that the last must be kept apart under the present generic conception.

I am uniting *S. Faguetiana* and *S. Ridleyana* only after careful examination of collections both from Borneo and the Peninsula. Most of the Bornean collections have rather larger leaves than our collections but there is overlapping in this respect. The only fruits I have seen from Borneo are on Beccari 2954 and 2960. In form and texture these are identical with the fruit of our tree but the calyx wings are slightly longer.

The description by King of *S. Ridleyana* together with the drawing accompanying these notes should be adequate definition of this species.

Collections examined—

SIAM:	S'pore 24219, 24222, 24224 and 24339.
KEDAH:	C.F. 8907, 12225, 21924 and 27402.
PERAK:	King 3617 (Type of <i>S. Ridleyana</i> , King); C.F. 11591, 12067, 24512, 25439 and 25711.
SELANGOR:	C.F. 18226, 18247, 23094, 23211, 24386, 24394, 24397, 24398, 24450 and 24706.
NEGRI SEMBILAN:	C.F. 23348 and 23681.
PAHANG:	C.F. 1275, 3945, 3949, 5510, 6620, 6651, 8877, 9505, 10576, 10713, 10714, 10715, 10731, 12836, 15752, 23167, 23370 and 29305.

BORNEO:

Becc. 2566, 2954, 2960 and 3039
(Types of *S. Faguetiana*,
Heim). C.F. 12992, 28652,
28656, 28693 and 28705
(Brunei). ? Baram 241 and
307.

(Note.—It is possible that Baram 241 and 307 may belong to this species. The flowers are identical in every way with those of *S. Faguetiana* except for the petals which are much longer than any I have seen in our collections).

This is the tree which is usually called *damar siput*. Herbarium collections show considerable variation resulting in the tree having been described under two different names. These are here united and the older name of *S. Faguetiana* is retained.

Shorea hopeifolia (Heim) Symington, new comb.: *Cotylelobium* ? *hopeifolium*, Heim, Bull. Soc. Linn. Paris, i (1891) 971: *Shorea Ridleyana*, King, Journ. Asiatic Soc. Bengal, lxii, pt. 2 (1893) 115, in part; Foxworthy, Mal. For. Rec. 10 (1932) 209, in part: *Hopea Heimiana*, Brandis, Journ. Linn. Soc. xxxi (1894) 63: *Hopea albescens*, Ridley, Journ. Str. Br. R. As. Soc. 73 (1916) 142; not of Foxworthy, l.c. 122.—Plate XLVI.

Heim first described this species in 1891 from a fragmentary flowering collection of Beccari, No. 2491, referring it with hesitation to the genus *Cotylelobium* and giving it the inappropriate specific epithet "*hopeifolium*." Two years later Brandis examined the same collection and transferred the plant to *Hopea*, renaming it *Hopea Heimiana*. In his description Brandis complains of the fragmentary nature of his material and gives rather an unsatisfactory account of the flower structure. In examining the same collection I was fortunate in finding one almost perfect flower which has enabled me without doubt to establish the identity of the plant with Ridley's *Hopea albescens*. In 1893 King described his *Shorea Ridleyana* from two sheets, Nos. 3617 and 3571. The former, upon which his description appears mainly to be based, is *S. Faguetiana*, Heim, to which I have reduced King's species, but No. 3571 is identical with *S. hopeifolia* (Heim) Symington. These species are so very closely related that it is not surprising that confusion should have occurred.

Foxworthy has followed King in including our collections of this species together with those of *S. Faguetiana*

under *S. Ridleyana*. To *Hopea albescens*, Ridl. he has referred a number of our collections which will probably turn out to be *Hopea fagifolia*, Miq.

Fruiting collections of this species have enabled me definitely to refer the plant to the genus *Shorea*. Unfortunately I must resurrect the specific epithet of Heim which is inappropriate and misleading.

Previous descriptions of this tree being hardly adequate I have prepared the following—

A medium to large tree; young branchlets slender, dark, lenticellate, minutely ridged and glabrous. *Leaves* thinly coriaceous glabrous, broadly ovate or oblong-lanceolate, bluntly acuminate at the apex, base rounded or cuneate sometimes with two glands at the insertion of the petiole; margin slightly inrolled; when dry usually purplish brown above, lighter beneath with purple veins; 4.5–9 cm. long, 2–5 cm. broad; petiole a little over 1 cm., rugose; secondary nerves 8–12 prs. spreading, inarching towards the margin, conspicuous beneath; between the secondary nerves 2 or 3 tertiary nerves leave the midrib parallel to the secondaries; tertiary reticulations usually distinct beneath. *Panicles* axillary and terminal, up to 7 cm. long, densely sericeous or fulvous pubescent, lax, branches each with 4–6 flowers, distichous and regularly alternating; flower bracts fugaceous, oblong, obtuse cymbiform, sericeous pubescent without. *Flowers* secund, 6 mm. long including the pedicel; pedicel 2 mm. *Sepals* sub-equal, rotundate, retuse (sometimes mucronate) at the apex, tomentose outside, glabrous within. *Petals* oblong, fimbriate obtuse at apex, 3 mm. long, pale yellow, sparsely puberulous outside. *Stamens* 15, sub-equal; filaments dilated in the lower half, arranged in 3's (2 long and 1 short) opposite each petal; anthers shorter than the filaments; awn filiform about the same length as the anther. *Ovary* conical, tomentose; stylopodium present but not obvious; style short, cylindric, glabrous; stigma minute. Fruit (immature) ovoid, pale tomentose, 5 mm. long, enclosed by but free from the accrescent calyx cup which is distinctly 5-angled, flattened at the base and sparsely stellate puberulous; wings papyraceous, puberulous with 7 longitudinal veins; 3 large wings sub-equal 5 cm. long, 1 cm. broad; 2 small wings 3 cm. long and 6 mm. broad.

To avoid further confusion of these very closely allied species, the main diagnostic characters of *S. hopeifolia* and *S. Faguetiana* are here enumerated. Along with these the characters of *Balanocarpus multiflorus* (Burck) Symington (= *B. penangianus*, King) are also considered, because although this species is quite distinct when in fruit, in

flower, vegetative characters and in the field it comes very close indeed. So remarkably similar are these three species that one cannot but doubt the sagacity of considering the nature of the fruiting calyx as a reliable index to the natural group to which they belong.

	<i>Shorea hopeifolia</i>	<i>Shorea Faguetiana</i>	<i>Balanocarpus multiflorus</i>
Leaves	Usually oblong-lanceolate or broadly ovate, purplish-brown above, greenish-brown or purple beneath with conspicuous purple veins. Secondary nerves 8-12 prs.; two or three tertiary nerves leave the midrib between each of the secondary nerves and parallel to them.	Ovate-lanceolate, usually larger than those of the other two species, when dry usually pale green or yellow above and lighter beneath Secondary nerves 8-12 prs.; tertiary nerves not as in <i>S. hopeifolia</i>	Usually oblong lanceolate, pale viridian above and golden yellow beneath. Secondary nerves 7-10 prs.; tertiary nerves not as in <i>S. hopeifolia</i>
Flower pedicel	2 mm. long	1 mm. long	Less than 1 mm. long
Sepals	Rotundate, retuse, sometimes mucronate	Obovate, acute	Triangular, obtuse & sometimes mucronate
Petals	A little more than twice as long as sepals	As in <i>S. hopeifolia</i>	About six times as long as sepals
Appendage to connective	As long as anther	Between 1 & 2 times as long as anther	As long as anther
Ovary	Densely tomentose	Minutely puberulous	Minutely puberulous
Fruit	Segments of fruiting calyx all enlarged into wings	As in <i>S. hopeifolia</i>	Segments of fruiting calyx forming a toothed cup shorter than the fruit.

Collections examined—

PERAK: King 3571 (cited as *S. Ridleyana* by King).

NEGRI SEMBILAN: C.F. 648.

PAHANG: "D² and D³", De Sylva (Types of *H. albescens*, Ridl.) ; C.F. 0704, 5158, 5444, 6618, 7931, 8112, 8353, 13784, 15702, 23251 and 26037.

JOHORE: C.F. 5851.

BORNEO: Beccari 2491 (Type of *C. hopeifolium*, Heim and *H. Heimiana*, Brandis).

As yet we know but little of this tree in the jungle. Most of our collections are from the east of the Main Range in Pahang but it has also been collected in Tebong Reserve in Negri Sembilan and near Kluang in Johore. It has been collected under the names of *seraya*, *seraya batu*, *seraya labu*, *damar hitam* and *damar siput jantan*. The indications are that it closely resembles *Shorea Faguetiana* (damar siput) and *Balanocarpus multiflorus* (damar hitam) in the field as well as in the herbarium.

✓ ***Balanocarpus multiflorus*** (Burck) Symington, new comb.:
Doona multiflora, Burck, Ann. Jard. Bot. Bog. VI (1887) 234: *Richetia latifolia*, Heim, Bull. Soc. Linn. Paris, ii (1891) 976: *Richetia oblongifolia*, Heim l.c., 979: *Richetia acuminata*, Heim, l.c. 979: *Richetia penangiana*, Heim, l.c. 980: *Balanocarpus penangianus*, King, Journ. Asiat. Soc. Bengal, lxii, pt. 2 (1893) 131 and Ann. Bot. Gard. Calcutta, V. 2 (1896) 158, Pl. 191B.; Foxworthy, Mal. For. Rec. 3 (1927) 58, with 2 plates, and Mal. For. Rec. 10 (1932) 143: *Hopea multiflora*, Brandis, Journ. Linn. Soc. xxxi (1895) 60; not of Foxworthy, Mal. For. Rec. 10 (1932) 119: *Balanocarpus latifolius*, Brandis, l.c. 112; Foxworthy l.c. 145: *Balanocarpus acuminatus*, Brandis, l.c. 113.—
 Plate XLVII.

This species was first described as *Doona multiflora* by Burck in 1887 from a flowering collection made in Sumatra. In 1895 Brandis identified with this a collection bearing flowers made by Curtis in Penang and transferred the species to *Hopea*. Meanwhile Heim had described *Richetia latifolia*, *R. oblongifolia* and *R. acuminata* from fruiting collections made by Beccari in Borneo and *R. penangiana* from a collection of Curtis from Penang. These four collections are undoubtedly all of the same species but are representative of the variation found in leaf size and shape. Heim's species did not long remain in the genus to which he referred them. In 1893 King referred *Richetia penangiana* (Heim's type of the genus) to the older genus *Balanocarpus*, and in 1895 Brandis transferred *R. latifolia* and *R. acuminata* to the same genus and reduced *R. oblongifolia* to synonymy with *Balanocarpus latifolius*.

In 1899 Boerlage, in Cat. Hort. Bog. p. 102, drew attention to the similarity between *H. multiflora*, Brandis and *B. penangianus*, King but the reduction was never made.

Foxworthy's conception of *Balanocarpus penangianus* is quite clear and the collections C.F. 8135 and 15756 have quite reasonably been referred by him to *B. latifolius*, but

they differ from the collections under *B. penangianus* only in inessential characters which do not constitute specific distinction. He is mistaken, however, in referring the collections cited under *Hopea multiflora* (Burck) Brandis to that species. These collections belong to two distinct species one of which is probably *Hopea fagifolia*, Miq. and the other appears to be most closely related to *Hopea plagata*, Vidal.

This species has been adequately botanically described and figured by King under *Balanocarpus penangianus* but with the supply of material now available it is possible to make the following amplification—

The leaves may have as many as 10 pairs of nerves which are raised and often very conspicuous on the lower surface. The fine reticulations of the leaf may be inconspicuous or clearly defined and of a pellucid nature. It is very characteristic of the species that the leaves usually dry to a pale viridian colour above and a light golden-brown beneath. Some leaves may be over 5 cm. broad. Although 15 is the usual number of stamens, occasionally only 10 are present. Occasionally there are distinct indications of a stylopodium. The fruit may be considerably more swollen in the upper portion than King has figured it and may be as much as 2 cm. long and 1.2 cm. broad.

Collections examined—

PENANG:	Curtis 429 (type of <i>R. penangiana</i> , Heim) and 3605; S'pore 3145, 3264, 3293, 3403, 3469, 3492, 3714, 3748 and 4650; C.F. 1844, 2470, 2562, 10846 and 11656.
KEDAH:	C.F. 8905 and 27470.
PERAK:	King 3333; C.F. 0114, 4571, 8843, 25428, 25449, 25508, 28982 and 28983.
DINDINGS:	C.F. 16584 and 27850.
SELANGOR:	C.F. 5204, 9971, 10819, 12954, 14830, 14831, 22057, 22073 and 22832.
NEGRI SEMBILAN:	C.F. 1790, 2006, 2125, 6552 and 12823.
MALACCA:	C.F. 2064.
TRENGGANU:	C.F. 26707 and 26744.
PAHANG:	C.F. 8135, 15756, 15770 and 26175.

- SUMATRA: "Ex. Herb. Bog. Recd. Kew
3/1888" (? type of *D. multiflora*, Burck).
- BORNEO: Beccari 2511 (type of *R. oblongifolia*, Heim), 2892 (type of *R. latifolia*, Heim) and 2942 (type of *R. acuminata*, Heim); C.F. 28703 (Brunei).

This is the tree commonly known to Malayan Forest Officers as *damar hitam* under the specific name of *Balanocarpus penangianus*, King. With the reduction of King's species to synonymy with the species originally described by Burck as *Doona multiflora* the specific epithet of the former gives way to the older epithet and the new combination becomes *Balanocarpus multiflorus* (Burck) Symington.

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Names of species especially dealt with in this paper are shown in heavy type and synonyms are printed in italics.

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Plate 33.



Plate 34.



Plate 35.



Plate 36.

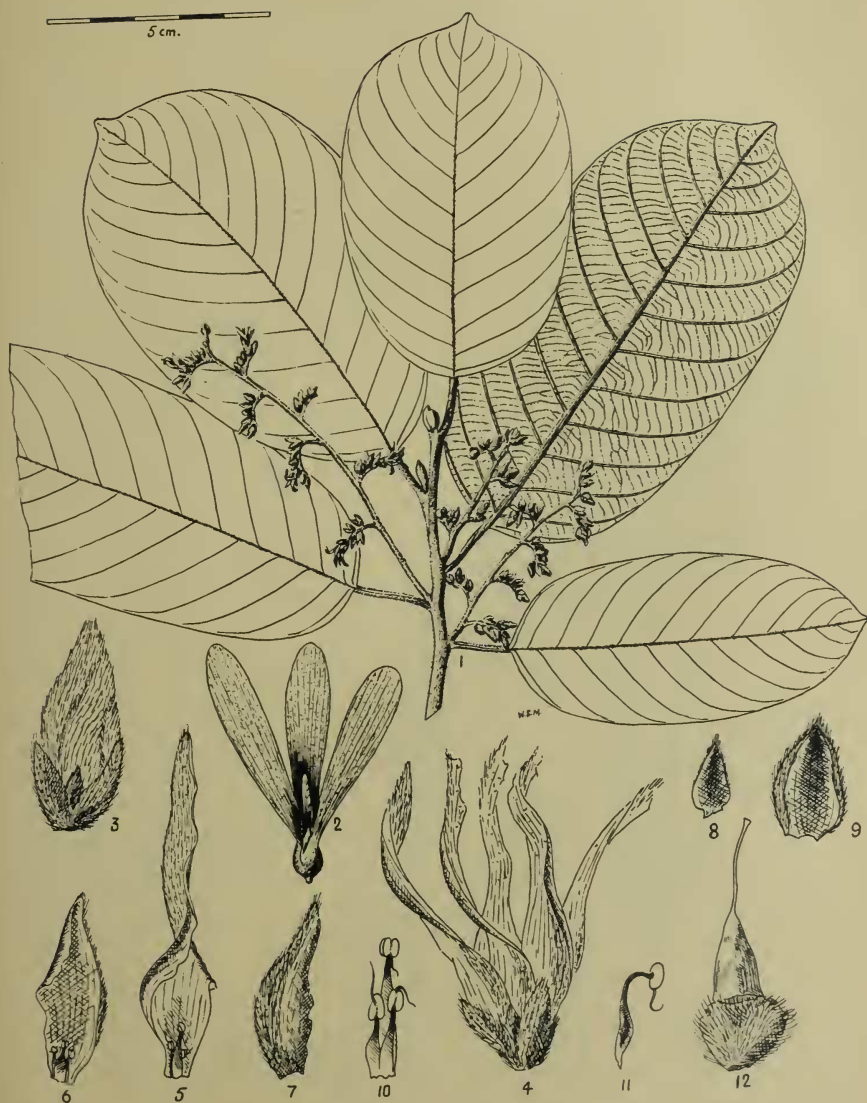


Plate 37.

5 cm.



Plate 38.

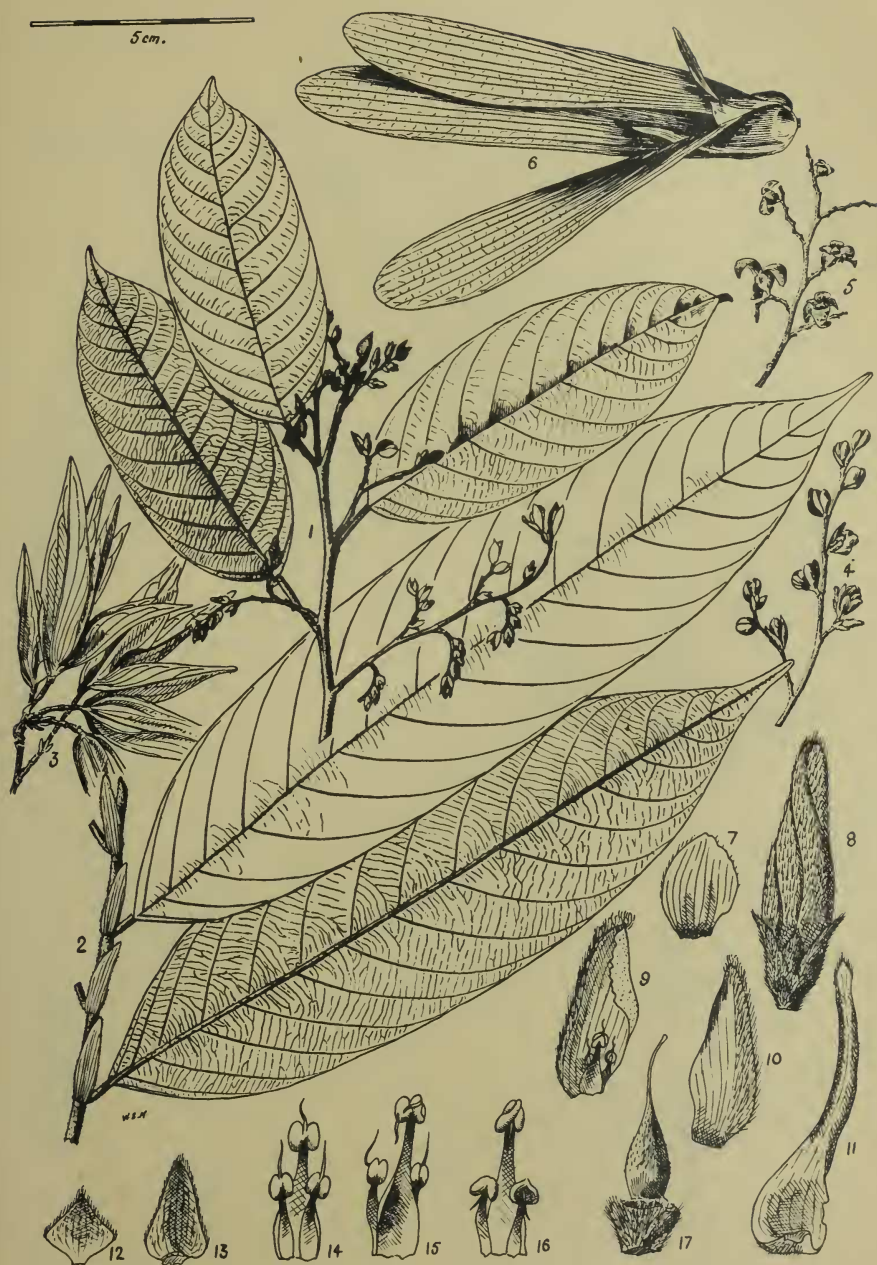


Plate 39.

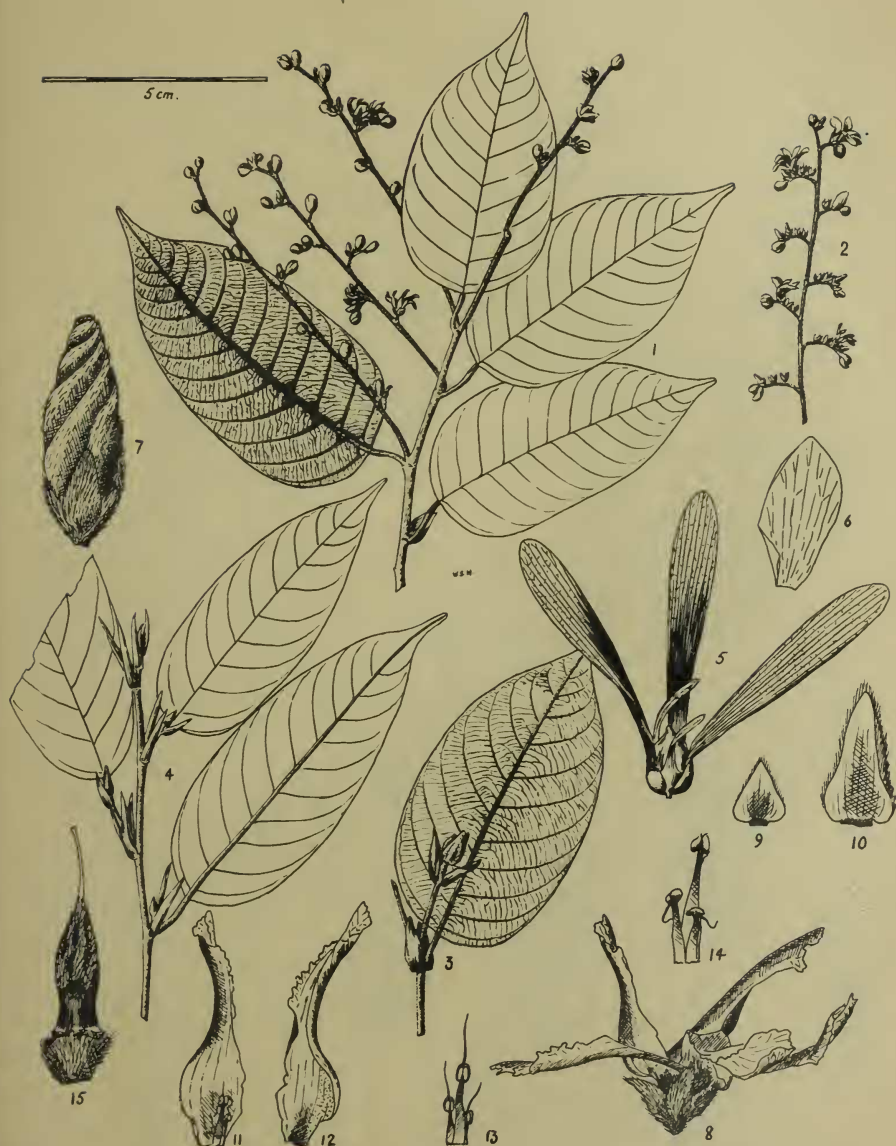


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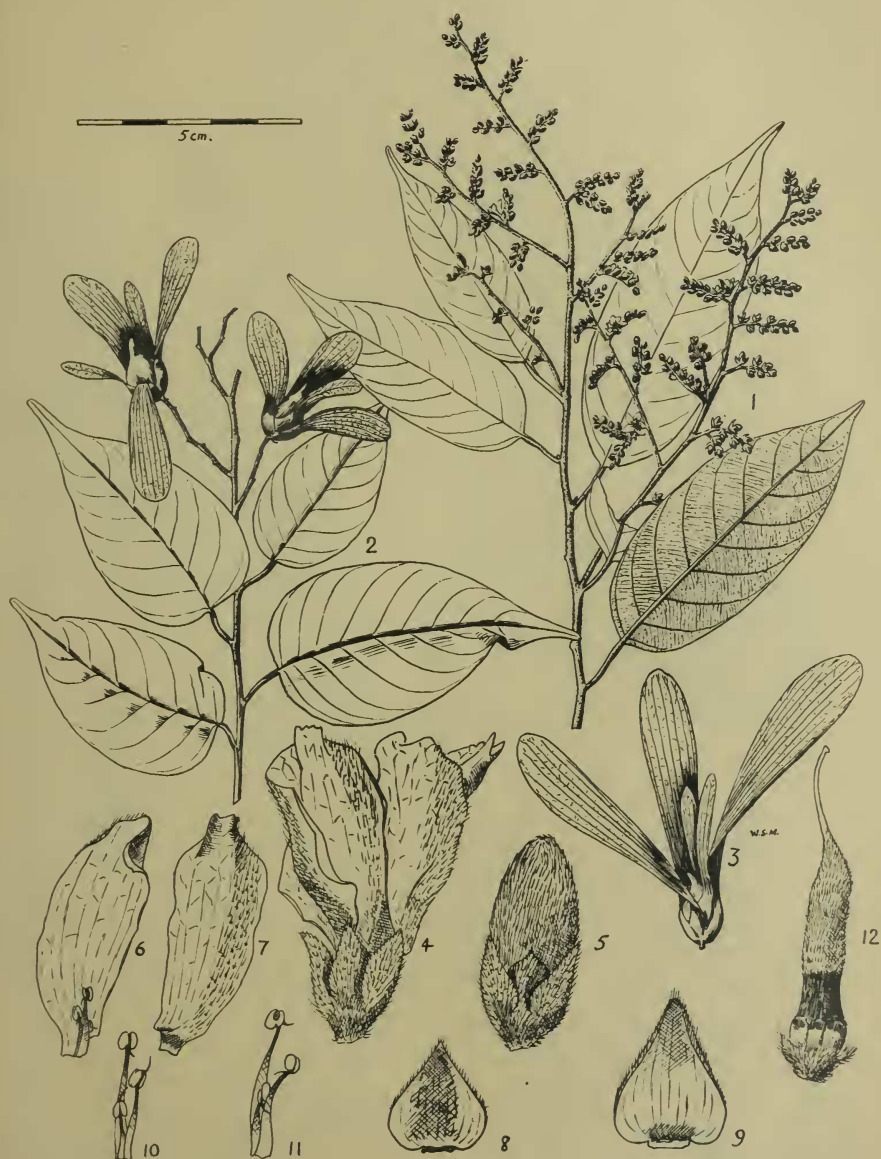


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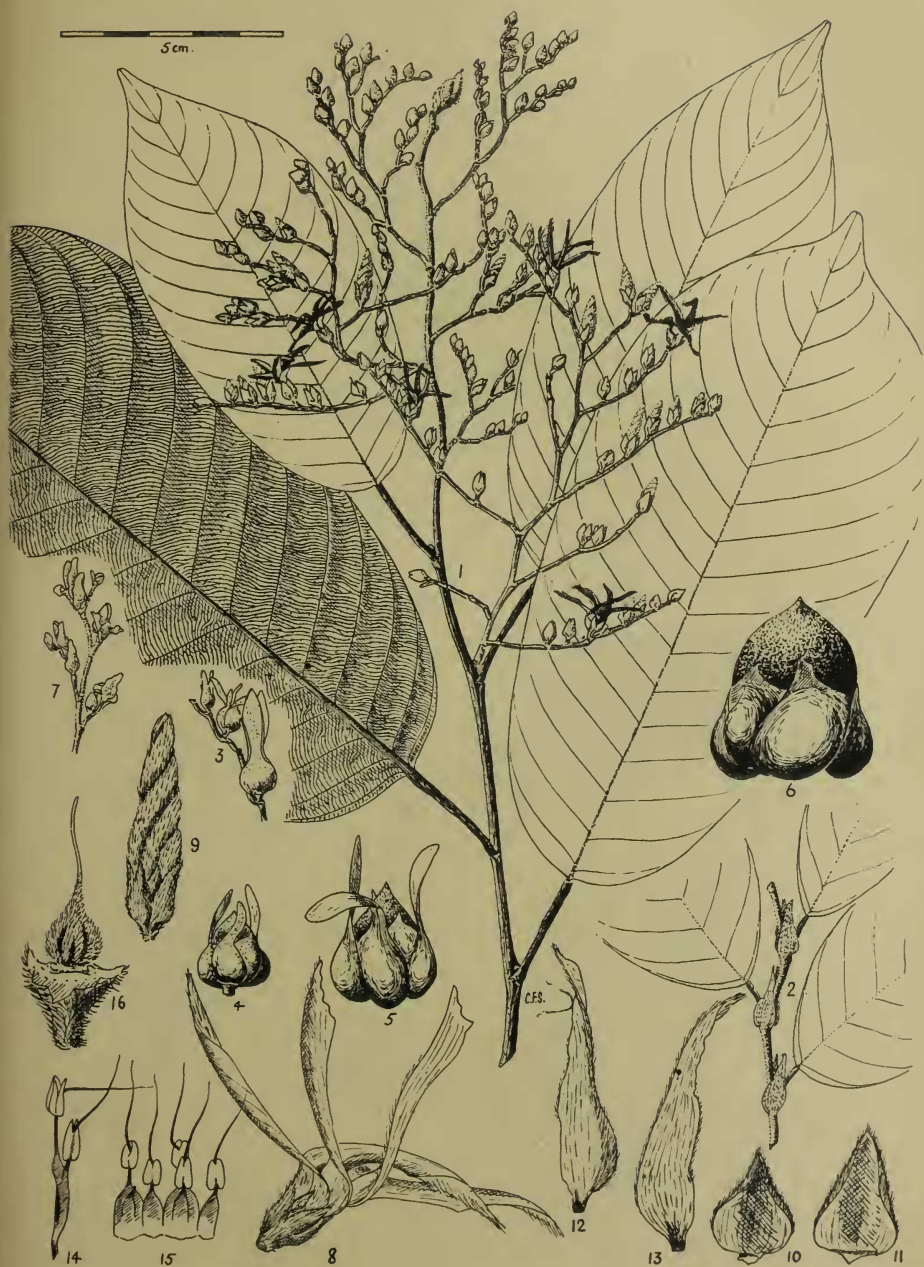


Plate 42.



Plate 43.



Plate 44.



Plate 45.

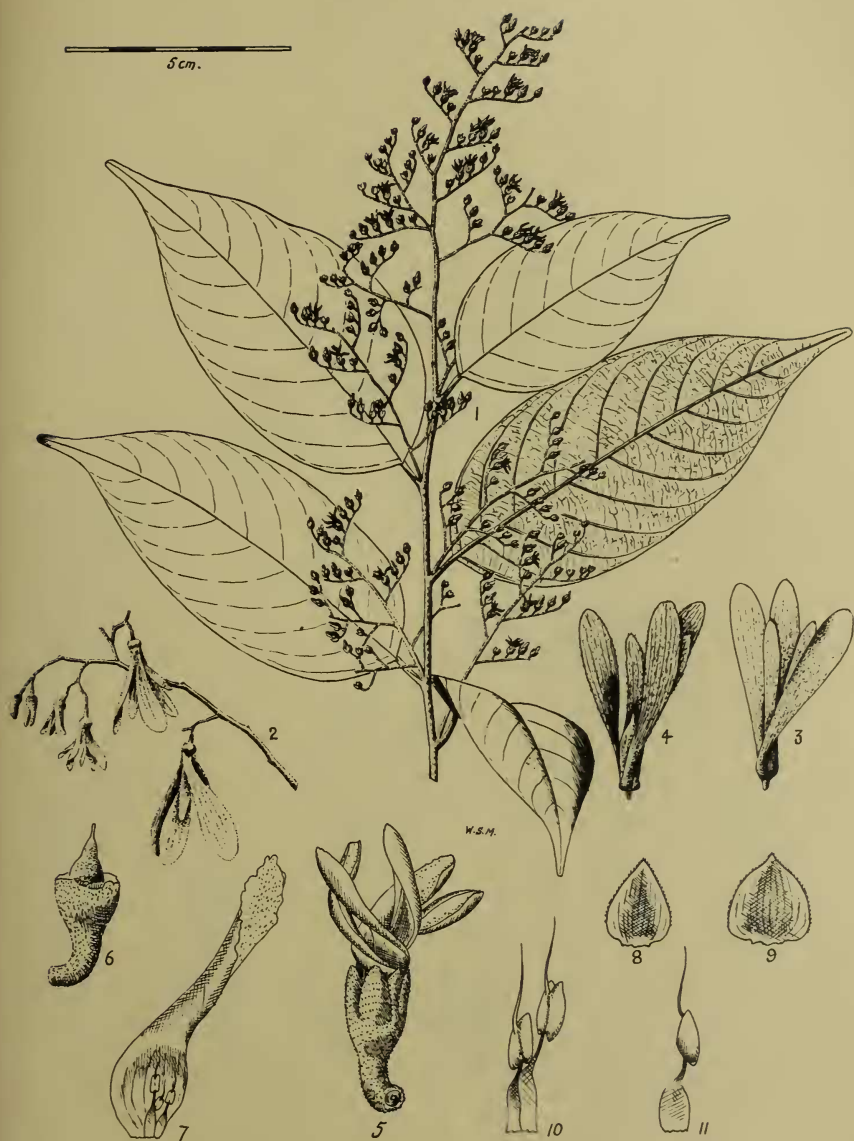


Plate 46.



Plate 47.

